C-3.4 Explain the unique bonding characteristics of carbon that have resulted in the formation of a large variety of organic structures.

**Revised Taxonomy Levels 2.7 B Explain conceptual knowledge**

**Students did not study this concept in physical science**

**It is essential for students to**

- Understand bonding in the allotropic forms of carbon, diamond and graphite
- Describe hybridization ($sp^3$) of simple molecules
- Understand how the capacity to form four covalent bonds results in several bonding possibilities for carbon, including
  - Single, double, and triple bonds
  - Ring structures
  - Covalent network

**Assessment**

The verb, explain means that the major focus of assessment should be for students to "construct a cause and effect model". In this case, assessments will ensure that students can model $sp^3$ hybridization for many possible bonding configurations for carbon. Because the indicator is written as conceptual knowledge, assessments should require that students understand the "interrelationships among the basic elements within a larger structure that enable them to function together." In this case, assessments must show that students can construct a cause and effect statement relating how $sp^3$ hybridization allows for four lone electrons and therefore many possible bonding configurations.